PERMIT MODELING GUIDELINES

City of Albuquerque
Environmental Health Department
Air Quality Division
Permitting Section

INTRODUCTION

Albuquerque / Bernalillo County Air Quality Control Board (A/BCAQCB) Regulations 20 NMAC 11.41.11.2.2.D & E and 20 NMAC 11.42.11.1.1.D.10 require an applicant to demonstrate the effects that a proposed facility will have upon any New Mexico or National ambient air quality standard (NAAQS), or an applicable New Source Performance Standard (NSPS) or National Emission Standard for Hazardous Air Pollutants (NESHAP) limitation or any Air Quality Control Board rule. This demonstration must relate the expected emissions from the facility to the maximum off-site ambient air impact. The required information must be developed using an Environmental Protection Agency (EPA) approved dispersion model consistent with the site topography of the proposed facility.

Initial evaluations of the facilities emissions can be made using the model SCREEN 3, which is available from the EPA's Technology Transfer Network as well as several different environmental engineering firms. The model inputs must reflect the actual expected emission parameters of the source. SCREEN 3 should be run with the FULL METEOROLOGY option. The use of other meteorological conditions must be fully justified and documented in the permit application. If the predicted ambient impacts modeled with SCREEN 3 are less than the above referenced standards and/or limitations for the emitted pollutants, then no further modeling analysis is needed.

If the SCREEN 3 ambient impacts are higher than the above referenced standards and/or limitations for the emitted pollutants, then additional modeling analyses will be required. The model of choice for additional analyses is ISCST 3 (ISCST 2 is acceptable for the time being), available from the sources mentioned above, which should be run using a rectangular grid receptor array. Model inputs must reflect the actual expected emission parameters of the source. In addition, ISCST 3 should be run using the regulatory default options and a 100-meter by 100-meter receptor array for areas outside the fence line, out to 1 kilometer. If the radius of impact exceeds I kilometer, the receptor array spacing may be increased to 500 meters for those areas beyond 1 kilometer. The emission point or points, buildings and fence lines should be located using exact UTM coordinates, however the receptor grid may be located at an even 100 meter spacing.

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Prepared by George L. Dingman

In both SCREEN 3 and ISCST 3 a decision concerning rural vs. urban dispersion coefficients must be made. Use URBAN 1 RURAL DISPERSION COEFFICIENTS CLASSIFICATION, (Attachment A) to make this determination. Rural dispersion may frequently be used as a default since it is more conservative i.e. less dispersion, if this use does not produce ambient violations. ISCST 3 requires an actual meteorological data file. Albuquerque airport and Bernalillo meteorological data for several years are available from the sources mentioned above. The decision on meteorological data sets should be made, based on facility elevation, topography and location (river valley or heights).

MERGING PARAMETERS FOR MULTIPLE STACKS

If a source emits the same pollutant from multiple stacks within 100 meters of each other the stacks may be merged into one stack, if stack height, flow rates, and stack gas exit temperatures differ by no more than 20% each. Compute a value of M for each stack using the equation below and use the stack with the smallest M value as the "merging" stack. Sum the emissions from alt stacks to obtain the "merged" emissions from the "merged" stack.

$$M=HVT/Q$$

where:

W = stack height (m).
V = stack gas volume flow rate (m^3/s)
T = stack gas exit temperature (K)
Q = pollutant emission rate (g/s)

FACTORS TO CONVERT 1-HOUR CONCENTRATION TO OTHER AVERAGING PERIODS

	AVERAGING PERIOD			
Stability	3-hour	8-hour	24-hour	Annual
A	1.00	0.45	0.15	0.08
B	1.00	0.60	0.20	0.08
C	1.00	0.67	0.26	0.08
D	1.00	0.67	0.53	0.08
E	1.00	0.67	0.34	0.08
F	1.00	0.67	0.30	0.08

POINT SOURCES EMITTING VOC AND NOx

Several photochemical models are appropriate for determining ozone impacts from sources emitting Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx). These models require extensive input data and can be quite resource-intensive to set up and run. The Division recommends the screening procedure documented in Point Source Screening for Ozone Precursor Emissions, by Richard D. Scheffe. Table IV and Table V from this document are reproduced below. The ozone concentration in parts per hundred million (pphm) determined from these screening tables should be added to the ozone background for comparison to the NAAQS. Please contact the Division to obtain an ozone background appropriate for the source you are modeling.

Table IV Rural ozone increment (pphm) as a function of VOC emissions and VOC/NOx ratios.

	VOC/NOx Ratio		
VOC Emission TPY	>20	5-20	<5
50 TPY	0.4	0.4	1.1
75 TPY	0.4	0.4	1.2
100 TPY	0.4	0.5	1.4
300 TPY	0.8	1.0	1.7
500 TPY	1.1	1.4	1.9
750 TPY	1.6	1.9	2.3
1,000 TPY	2.0	2.4	2.7
1,500 TPY	2.7	3.0	3.3
2,000 TPY	3.4	3.8	3.7
3,000 TPY	4.8	5.2	4.3
5,000 TPY	7.0	7.5	4.8
7,500 TPY	9.8	10.1	5.1
10,000 TPY	12.2	12.9	5.4

Example calculation: Given

1. A rural VOC dominated source has the following emission parameters:
   -100 Tons per year VOC and 30 Tons per year NOx
   -Therefore the VOC/NOx ratio = 100/30 = 3.33

2. Use the column in the above table headed <5, since 3.33 <5

3. On the row for VOC emissions, under the column for <5 find the entry 1.4

4. The table, therefore, indicates a rural ozone increment for this source of 1.4 parts per hundred million (pphm). Local, background ozone levels will increase 1.4 pphm as a result of this sources' emissions.

As the table and calculation show, the incremental ozone increase due to emissions from a VOC dominated source depend on the gross VOC emissions and the VOC/NOx emissions ratio.

Table V Urban ozone increment (pphm) as a function of VOC emissions and VOC/NOx ratios.

	VOC/NOx Ratio		
VOC Emission TPY	>20	5-20	<5
50 TPY	1.1	1.1	1.0
75 TPY	1.2	1.1	1.1
100 TPY	1.3	1.2	1.1
300 TPY	1.8	1.6	1.9
500 TPY	2.2	2.0	2.8
750 TPY	3.3	2.6	3.9
1,000 TPY	4.1	3.2	4.7
1,500 TPY	5.8	4.2	4.9
2,000 TPY	7.1	5.4	4.9
3,000 TPY	9.5	7.8	6.5
5,000 TPY	13.3	12.0	9.3
7,500 TPY	17.3	16.7	12.5
10,000 TPY	21.1	20.8	15.5

Urban ozone increments are calculated as in the example above except the urban table is used to determine the increment.

DETERMINATION OF COMPLETENESS

The following requirements are intended to expedite processing the permit application. Each requirement is part of a complete modeling analysis and any deviations from these requirements must be pre-approved by the Division. If a complete analysis is submitted, review and approval of the permit are expedited.

A modeling report should be submitted (actual text, not a pile of model outputs) which demonstrates why the permit should be issued. This report will become a part of the permit application package available for public review and should document the methods, assumptions and other elements of the analysis. The following topics must be addressed/included within or with the report:

Required elements of a complete modeling analysis

1. A 3.5" floppy disk containing the following:
   a. Input data for all model runs;
   b. ISCST 3 plot files, if applicable;
   c. Meteorological data set used;
   d. Any nonstandard or modified source codes;
   e. Output files for all model runs not submitted as hard copies.

2. An appropriate, textual discussion of modeling approach for screening and any refined modeling including which models and model options were used and why they were appropriate to the permit application.

3. A discussion of the meteorological data used including source of the data, how missing data were handled, how stability class was determined and how the data were processed.

4. Site and receptor grid array spacing description.

5. A list of all sources used in the analysis if multiple sources were considered.

6. A copy of the appropriate United States Geological Survey (USGS), 7.5 minute topographic map showing the location of the proposed facility. If a portion of a map is submitted, the original quadrant must be identified.

7. Model input source numbers or names must be cross-referenced to the sources listed in the permit application.

8. A modeling summary showing maximum concentrations and comparisons to standards.

9. Hard copy of output files, including echoing of input files. Use best judgment as to which and how many output files should be submitted. It is not always necessary to submit hard copies of all output files (see I.e above).

10. Modeled stack parameters must match application stack parameters or an explanation of the differences must be provided.

11. **Bind the Report and Analysis! Very Important!**
    The loss of portions of the report and analysis can result in incomplete rulings. Three ring binders or plastic side bindings are preferred.

Summary of required analysis report elements:

a. a narrative summary of the proposed action;
b. the models used and supporting justification;
c. all criteria, Part III, or Hazardous Air Pollutants emitted by the proposed source;
d. all appropriate local, state and federal averaging periods for each pollutant.

ATTACHMENT A

URBAN 1 RURAL DISPERSION COEFFICIENTS CLASSIFICATION

The following land use procedure should be used when determining whether urban or rural dispersion coefficients should be used when performing an ambient impact analysis using dispersion modeling. Should urban dispersion coefficients be required and your particular model gives you the option of URBAN-1, URBAN-2, or URBAN-3, the URBAN-3 dispersion coefficients should be selected.

(1) Classify the land use within the total area, &, circumscribed by a 3 kilometer (km) radius circle about the source using the meteorological, land use, typing scheme proposed by Auer[1].

(2) If land use types 11, 12, C1, R2, and R3 (defined below) account for 50 percent or more of A_o, use urban dispersion coefficients; otherwise use appropriate rural dispersion coefficients.

DEFINITION OF LAND USE TYPES

(Meteorological Anomalies. Journal of Applied Meteorology, 17:636643)

TYPE	USE AND STRUCTURES	VEGETATION
I1	Heavy industrial - Major chemical, steel and fabrication industries; generally 3-5 story buildings with flat roofs.	Grass and tree growth extremely rare; <5% vegetation
I2	Light-moderate industrial - Rail yards, Truck depots, Warehouses, Industrial parks, Minor fabrications; generally 1-3 story buildings with flat roofs.	Very limited grass, trees almost totally absent; <5% vegetation
C1	Commercial - Office and apartment buildings, hotels <10 stories; with flat roofs.	Limited grass and trees; < 15% vegetation
R2	Compact residential - Single, some multiple family dwellings with close spacing; generally <2 story, pitched roof structures; garages (via alley); no driveways.	Limited lawn sizes and shade trees; <30% vegetation
R3	Compact Residential - Old multi-family dwellings with close (<2 meter) lateral separation; generally 2 story, flat roof structures; garages (via alley); no driveways	Limited lawn sizes, old established shade trees; < 35% vegetation